

POPULAR
HISTORY OF THE PALMS
AND THEIR ALLIES,

CONTAINING

A FAMILIAR ACCOUNT OF THEIR STRUCTURE,
GEOGRAPHICAL AND GEOLOGICAL DISTRIBUTION,
HISTORY, PROPERTIES, AND USES,
AND A COMPLETE LIST OF ALL THE SPECIES
INTRODUCED INTO OUR GARDENS.

BY

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VOYAGE OF H.M.S. HERALD, ETC. ETC.

LONDON:

LOVELL REEVE, 5, HENRIETTA STREET, COVENT GARDEN.

1856.



JOHN EDWARD TAYLOR, PRINTER,
LITTLE QUEEN STREET, LINCOLN'S INN FIELDS.

TO
ALEXANDER VON HUMBOLDT

• *This Little Work*

IS DEDICATED

•
WITH FEELINGS OF HIGH REGARD AND ESTEEM
•

BY HIS FRIEND AND ADMIRER,
•

BERTHOLD SEEMANN.

P R E F A C E.

IN producing the present little Work I cannot say that I have yielded to any urgent solicitations of friends, but I must own that after having made known my resolution to write a Popular History of the Palms and their Allies, I received so much warm encouragement and ready assistance from all sides, that I feel I have undertaken a task in which many are interested. The late Dr. E. Stocks furnished me with notes on the Palms of Scinde, and other parts of India, with which he was familiar; Professor C. B. Heller, well known as a successful explorer of the South-eastern States of Mexico, drew up an account of the Palms of that region; Professor Göppert, one of the most accomplished palæontologists of the day, sent the necessary information about

the fossil Palms; John Miers, Esq., the distinguished traveller and botanist, communicated notes on the Palms of Chile and Peru; Dr. Carl Bolle, the indefatigable investigator of the Canary Islands, wrote an elaborate treatise on the Palms of that archipelago; Dr. J. D. Hooker, the talented author of the 'Flora Antarctica' and other publications of high repute, readily opened some of the vast treasures of information accumulated during a voyage round the world and scientific journeys in the East Indies; and lastly, though not least, Mr. John Smith, the intelligent curator of the Royal Botanic Gardens at Kew, and his son, the zealous curator of the Museum of Economic Botany at the same Institution, obligingly gave me the loan of a series of notes, containing extracts from works often not easily accessible, and information obtained from the lips of travellers, such as Purdie and others. I have also to acknowledge to the three last-named gentlemen, as well as to Mrs. Hooker, my deep sense of gratitude for assisting in seeing this Work through the press, and eradicating the mistakes and crudities which here and there had crept into the manuscript. Besides these sources of information,

my own circumnavigation of the globe in H.M.S. Herald, and travels in tropical countries, put me in possession of numerous facts bearing upon the subject. I have also consulted all the works I could obtain—and this number is nearly two hundred; but as no attempt has ever been made to collect such information as that contained in the present publication, this branch of botanical literature is of course very much scattered about, and it would be dishonest to pretend that the Popular History of the Palms, etc., contains an account of all that has ever been written on this subject. However, I may safely affirm, without the fear of contradiction, that there is no work in existence, in any language whatever, in which an equal amount of information, such as here given, is to be met with.

The quotations from other works, though they may appear between inverted commas, have in most instances been very much condensed; and as there was, as might be expected in information derived from so many different quarters, a great diversity in the terms employed, I have endeavoured to reduce them to uniformity, especially where the rules of modern botanical terminology rendered such a

proceeding imperative. For instance, the term "leaf" has been substituted for "branch" and "frond," "segment" for "pinnule" and "leaflet." Less stringency has been shown with words which did not interfere with those terminological laws; that of "kernel," for example,—to the use of which, in strictly scientific works, strong objections must be raised, as it denotes sometimes cotyledons, sometimes the albumen, sometimes the whole seed,—has been admitted, as it has a fixed meaning in popular language, and people will always know a kernel when they see one.

The illustrations have been adopted from the works of Martius, Hooker, Wallace and others, by M. J. Ch. Frank, to whom great praise is due for the skill shown in reducing them, mostly from large folio plates, to the small size of this volume, without sacrificing their minute characteristic features.

That I should have been desirous of dedicating this little Work to so great a man as Humboldt, will be found quite natural by those who know that it was Humboldt who more than half a century ago wrote the first popular account of the Palms, and that it was he who, by his glowing de-

scriptions of tropical scenery, did more than any one living to encourage that desire for the exploration of equinoctial regions, to which we owe indirectly so much of our knowledge of these Palms, and directly the elaborate works of Martius, Griffith, Blume, and other Botanists of eminence, more particularly devoted to them. How much Humboldt himself was pleased with the dedication will be evident from the following letter, which in justification of what I have stated cannot be very well withheld:—

“ *Berlin, June 18, 1855.*

“ My dear Friend and ‘ Travelling Companion,’ *

“ Your kind letter of the 13th instant has been a source of great pleasure to me. I received it the moment of my return from Potsdam, early this morning, there being no postal delivery on a Sunday at Berlin. As there is only an hour left until the departure of the mail-train, and as you are pleased to long for a speedy answer, I must unfortunately be very brief in expressing my high sense of gratitude for the honour you intend to confer upon me. A dedication from you, dear Seemann, cannot but be extremely agreeable and flattering, and I gladly accept your favour, but on the express condition that you will simply call me your friend,

* A playful allusion to my academical name, “ Bonpland.”—*B. S.*

and avoid every species of titulation, which is quite contrary to my way of thinking. . . . Your Work will, I am convinced, go through several editions; it begins in a jovial strain, but never oversteps, according to my opinion, the boundaries of good taste; it may be called popular, because, without supposing the reader to be possessed of any great botanical knowledge, it supplies him with an agreeable literary recreation. The 'low connections' (p. 12) with the plebeian Grasses have not proved a serious disadvantage to your patrician, aristocratic Palms. . . . I have read line for line of the sheets you sent, and as a proof thereof note two unfortunate misprints, which I discovered at page 33 and 34. The first is *Moricheles*, instead of *Morichales*. The terminations indicative of forests (*Waldendigungen*) form themselves in Spanish always in 'al' or 'ar;' thus, Pino, Pinal or Pinar (Pine-forest); Olivo, Olivar (Olive-forest); Roble,^l Robledar (Oak-forest). The second misprint is *Cauca* and *Erenato*, instead of *Caura* and *Erevato*. Of the Caura, which flows into the Erevato, I have published a special chart. Caura, again, is a tributary of the Orinoco, whilst Cauca is a tributary of the Magdalena. You will perceive from this that I have carefully perused your instructive pages. The description of the great Palm-house at Kew, and especially the paragraphs which immediately succeeded that, have pleased me very much indeed. Pray do not omit to mention the surprise travellers experience when beholding for the

first time European forms (*Pinus* for instance) growing together with tropical ones (Palms, etc.) in the same forest, as is the case at Chilpanzingo, on the western declivity of the Mexican tableland, or in that, on account of its mahogany, frequented Isle of Pines, south of Cuba. Peter Martyr (Angheria) states on the authority of one of Columbus's letters that *Pineta* and *Palmite* grew there together. The Conquistadores noticed a coniferous plant with fruit resembling Olives (*parezen azeytunos del Azarate de Sevilla*), which I take to be a species of the genus *Podocarpus*. As your Work will be much read, you must not forget to dwell upon the *oppositum* of the numerous littoral plants,—the little-known, small group of mountainous or alpine Palms (*Ceroxylon Andicola*, *Oreodoxa frigida*, and *Kunthia montana*). *Ceroxylon Andicola* I found in the cordillera of the Pass of Quindiu, between Ibague and Cartago, not lower on the declivity than 7930, not higher than 9700 English feet (you could say between 7900 and 9700 feet), in company of *Podocarpus*-trees and *Quercus Granatensis*.

“I am, etc.,

“ALEXANDER VON HUMBOLDT.”

I shall offer no apology for the numerous imperfections which, notwithstanding all the advantages I have enjoyed, may still appear in these pages. Those who have been en-

gaged in similar compositions will, I am sure, if they should happen to be among the number of my critics, deal leniently with me; whilst those who have not, will please to bear in mind that my "History of Palms" is not a purely literary production, but a scientific work, which, to meet the views of my publisher, has assumed a popular garb, in which mere literary considerations have been made subordinate to scientific accuracy.

BERTHOLD SEEMANN.

London, December 8th, 1855.

POPULAR HISTORY
OF THE
PALMS AND THEIR ALLIES.

INTRODUCTION.

My first acquaintance with the Palms was not in the great conservatories of Europe, nor in the virgin forests of tropical America or Asia, where I had afterwards an opportunity of studying them, but in a dusty schoolroom of my native town. Acquaintance with them was, I may say, not sought by me; but, as the reader will presently see, quite forced upon me. Our schoolmaster, having to keep in order about fifty unruly boys, had always a number of canes, the excellence of which we had an opportunity of testing whenever we had been guilty of a misdemeanor. Deeming our master's possession of these light, flexible sticks, with their yellowish polish, a circumstance not very conducive to our comfort, we seized

upon them whenever a fair chance presented itself. Having once laid hands upon them, they were, on the advice of some of the elder boys, cut into pieces about as long as cigars, lighted at one end, and thus used for practising smoking, so as to be perfect in that habit whenever the increased allowance of our pocket-money should admit of investing the requisite sum in the purchase of real cigars, genuine pipes, and unadulterated tobacco! Thus we succeeded in converting instruments peculiarly hateful to us into a great source of amusement; for such, I fear, I must call it. However, all our endeavours to exhaust the stock of our master were as ineffectual as if we had attempted to fill the leaky vessel of the Danaids. The supply was quite equal to the demand; and lo! to prove to us the utter uselessness of our illegal proceedings, we had one day, on leaving school, the satisfaction of seeing a whole waggon-load of those abominable canes entering the town. Some of us followed this interesting vehicle to the very door of the house in which the cargo was to be stored; and one of our number, bolder than the rest, actually ventured so far as to ask the person who took charge of it whence the sticks came, and what trees produced them, questions which drew forth the reply, that they had been sent from far across the

sea, and that they were the shoots of a species of *Palm*. This information had a most melancholy effect when repeated to our other school-fellows. Up to that moment, we had been labouring under the belief that the canes were the branches of some willows of our own county, and that, if we could only discover the place where they grew, we could easily destroy them, and thus free ourselves for ever from the tyranny of the magisterial sceptres. Even now, after their true source had been pointed out to us, those who had most strongly advocated the willow theory still clung to it; and as the point was one of vital importance to all, we determined to consult some book on the subject, so as to set our minds at rest. After a great deal of searching in the limited library at our disposal, we found in some encyclopædia a passage which, alas! confirmed the statement of the storekeeper. It informed us that the canes in question were slender stems of an East Indian Palm, belonging to the genus *Calamus*, and used for making bottoms of chairs, walking-sticks, etc. "Another species of this interesting genus" (very interesting, we thought), continued the book, "yields the famous 'Malacca canes' so much used in Europe." There was no appeal from such authority; and we, entertaining no longer any doubt about the true source

of our master's sticks, relinquished every hope of cutting off his inexhaustible supplies.

It was thus that my attention was first directed to that natural order of plants, the Palms, one of the largest, the most beautiful, as well as the most useful, of the whole Vegetable Kingdom. It was rather an odd introduction; but I daresay, if every one of my readers would only ask himself where and how he first came in contact with those plants of which the present work treats, narratives even more strange than the one related would probably be brought to light. Palms, indeed, supply so many of our wants, and administer so largely to our comforts, that those fully impressed with this grand truth, may well wonder how the human race can inhabit any parts of the globe whence they are excluded. It was therefore not merely a rhetorical figure when Linnæus, full of admiration for this noble tribe of plants, exclaimed—"Man *dwells naturally* within the tropics, and lives on the fruit of the Palm-tree; he *exists* in other parts of the world, and there makes shift to feed on corn and flesh." Take, for instance, a walk in the streets of London, and observe everywhere how substances originally obtained from Palms, and turned to useful purposes, meet your eye. That ragged boy, sweeping the crossing, and begging you

with a faltering voice, real or assumed, to 'remember poor Jack,' holds in his hands a broom, the fibrous substance of which was cut by the wild Indians of Brazil from the stems of a Palm; that gentleman, dressed in the tiptop of fashion, who playfully swings his 'Penang lawyer,' little thinks that, in carrying that walking-cane, he is in fact carrying a young plant of the *Licuala acutifida*; that fine lady's parasol-knob—what is it but a Coquilla-nut turned into that shape? Continue your walk, and you will find still more, worthy of notice in a Popular History of the Palms. Those "chip hats" so extensively worn on fine summer days, what are they made of?—the leaves of a Cuban palm (*Thrinax argentea*). Look at that stand, with heaps of dates upon it, gathered on the borders of the great Desert of Sahara, and eagerly purchased by the people; look at those fine cocoa-nuts, grown on the shores of the Indian Ocean and the Caribbean Sea, and here retailed in penny slices to the humbler inhabitants of the British metropolis. Step into a house, and there too will you observe many products obtained from Palms in the most remote corners of the globe. That thick brownish matting, now so generally used for covering halls, staircases, and offices, is woven from the husk (*mesocarpium*) surrounding the cocoa-nut. Those beautiful

pieces of furniture, which arrest your attention, are made of various kinds of palm wood. That elegant little plaything you see in the hands of yonder child, was skilfully manufactured of the bone-like kernels (*albumen*) of the Vegetable Ivory Palm. Those fine stearic candles illumining the room—what are they composed of but the fatty substance extracted from the fruit of the Oil Palm and the Cocoa-nut? That sago, which, under various disguises, appears at the dinner-table, it also is the produce, the pith, of Palms flourishing in the islands of the East Indian Archipelago. That arrack, pronounced by connoisseurs to be of excellent quality, it too is extracted from a Palm,—the Cocoa-nut. Be still more inquisitive, and ask of what that tooth-powder, so extensively applied, consists; and you will be told that its chief ingredients are Betel-nuts, previously reduced to charcoal, and dragon's blood,—both produced by palms; or examine our toilet soap, and you will find that the fatty substance, which enters so largely into the composition of it, has been derived from Palms. Everywhere you will meet numerous products of Palms, either in a raw state, or turned by the ingenuity of man to some useful purpose; and this too at a place thousands of miles from those regions which Palms principally acknowledge as their native

country. Even at such a distance, their benign influence is strongly felt; and millions of people, whose privilege it has never been to obtain even a glimpse of a single Palm, entertain feelings of well-founded gratitude towards an order of plants which is to them a source of so much usefulness and enjoyment.

But if such is the case in a city like London, and in a country like England, where few Palms ever grow except within the walls of a well-managed conservatory, and under the careful treatment of a judicious gardener, it is much more so the case in regions like those of tropical Asia, Africa, America, and Australia, where these elegant members of the Vegetable Kingdom flourish in all their native splendour, where the inhabitants derive nearly every necessary of life from them, and where almost every action of a man's daily occupation comes more or less in contact with them; associating them so closely with the traditions, the history, and the destiny of the countries in which they have taken up their abode, that it is quite impossible to treat of their religious, social, or political condition, without mentioning in a greater or lesser degree the Palms,—those splendid offspring of Tellus and Phoebus. To illustrate this more clearly, let us change the scene we behold on the banks of the Thames

for one of those on the Rio Negro, the great tributary of the Amazon. The background is a thick virgin forest, the wild domain of tiger-cats, tapirs, monkeys, and snakes; huge trees are densely crowded together; orchids, pepperworts, ferns, and other epiphytical plants cover their trunks; creepers are luxuriantly growing among them, here forming elegant festoons, there hanging slovenly, like ropes of a ship out of trim: all is teeming with vegetation. The foreground is an open spot with a few Indian huts and some isolated Palms, the dark green foliage of which, gracefully waving in the morning air, forms bold outlines, agreeably contrasting with the dark blue of the sky; a group of merry boys, almost entirely in the simple garb of nature, are playing around them, practising their bows and arrows, and reminding one of a petty army of young Cupids preparing for a conquering expedition.

A comparison of the scene with that we beheld in London is sufficient to create an interest for it. To learn more of an Indian's life becomes a prominent wish, and to visit one of these huts an irresistible desire. Let us enter then, guided by that enterprising traveller Mr. Wallace, one of those before us; the inmate is friendly disposed; he will make some allowance for our curiosity, and permits us to examine the

various articles which arrest our attention. The main supports of the building are stems of some forest-tree of heavy and durable wood, but the light rafters overhead are formed by the straight, cylindrical and uniform trunks of the Jara Palm (*Leopoldinia pulchra*). The roof is thatched with large triangular leaves, arranged in regular alternate rows, and bound to the rafters with sipos, or creepers; the leaves are those of the Caraná Palm (*Mauritia Carana*). The door of the house, a framework of thin hard strips of wood neatly thatched over, is made of the split stems of the Pashiuba Palm (*Iriarteia exorrhiza*). In one corner stands a heavy harpoon, for catching the cow-fish; it is formed of the black wood of the Pashiuba barriguda (*Iriarteia ventricosa*). By the side of it is a blowpipe, from ten to twelve feet long, and a little quiver full of small poisoned arrows, for procuring birds for food or for their gaily-coloured feathers, or even bringing down the wild hog or tapir; and it is from the stem and nerves of the petiole of two species of Palms that they are made. The great bassoon-like musical instruments, the Indian has made of palm-stems; the cloth in which he wraps his most valued feather ornaments is a fibrous palm-spathe; and the rude chest in which he keeps his treasures is woven from palm-leaves. His hammock, his bowstrings, and his

fishing-line are obtained from the fibres of different palm-leaves. The comb which he wears on his head, is ingeniously constructed of the hard wood of a Palm; and he makes fish-hooks of the spines, or uses them to puncture on his skin the peculiar markings of his tribe. His children are eating the agreeable red and yellow fruit of the Pupunha or Peach Palm (*Guilielma speciosa*), and from that of the Assai (*Euterpe edulis*) he has prepared a favourite drink, which he offers to his guests. That carefully-suspended gourd contains oil, which is the produce of the fruit of another species; and that long elastic plaited cylinder, used for squeezing dry the mandiocca pulp, extracted from the root of a shrubby Euphorbiaceous plant, the *Manihot utilisima*, is made of the trunk of one of the singular climbing Palms, which resists for a considerable time the action of the poisonous juice it comes in contact with.

The curtain may be allowed to drop for a moment on this view of Indian life. Enough has already been shown to inspire the reader, if not as yet with love, at least with respect, for a tribe of plants which constitutes so important an element in the social life of both the most civilized nations and the rudest savages. To make him still more favourably disposed towards Palms, I will give a general description of

them ; add a summary of their geological and geographical distribution, and a brief notice of their cultivation in northern Europe ; and then enumerate the most prominent species, with detailed accounts of their aspect, structure, history, and uses.

GENERAL ACCOUNT OF THE PALMS.

Palms have been termed "the Princes of the Vegetable Kingdom." This title, however poetical to some minds, is so far objectionable, as it may possibly lead those considering things in the abstract to the erroneous supposition that the Palms, like the chiefs of states, to whom they are thus compared, are placed pre-eminently at the head of the world of plants ; whilst, on the contrary, notwithstanding their beauty and usefulness, they occupy but a subordinate position in that classification of organized beings known as the Natural System of Botany. They belong, systematically speaking, to the *Endogens* or *Monocotyledons*, the same great division which comprises the Grasses, Sedges, Lilies, Orchids, and Screw-pines, and which stands about intermediate between the highest and lowest orders of the Vege-

table Kingdom. But the metaphor holds good in another sense: Palms may be said to be as exclusive as princes, forming close alliances amongst themselves, and acknowledging no *immediate* relationship with any of the numerous families of the great natural division amongst which they are classed. They seem to glory in isolation, proudly waving their graceful foliage amongst those with whom they are thrown together. Yet, as is often the case in every-day life, they have, like many noble families, low connections and poor relations. In their external structure, as well as in their internal organization, they approach nearest to the Grasses; plants which the same authority (Linnæus) who conferred upon Palms the dignity of princes, termed "the Plebeians." This relationship will probably be thought rather distant by those who, from want of other materials, compare the meadow-grasses of the temperate zones with the cocoa-nut trees of the tropics; but it will become more apparent when the huge Bamboo, as the representative of the Grasses, is placed by the side of some small Rattán, as that of the Palms. Indeed Nees von Esenbeck, one of the best systematic botanists of the present day, considers Grasses to be a sort of Palms of a lower grade; and he is not singular in that opinion. In habit, especially in the in-

stance cited, the two Orders have much in common: their leaves are formed upon exactly the same plan, the only difference being that those of the Palms are generally (not always) divided, and even the silicious secretions, so characteristic of Grasses, are observable in Rattans; whilst, about their flowers, it may be said that those of the Grasses are those of the Palms, with the floral envelopes removed and only the bracts remaining.

Palms* are perennial and woody plants; they are never

* The structure of the Palm has been well explained by various authors, and is generally looked upon as typical of that of Endogens in general. In the language of Lindley (Vegetable Kingdom, p. 95) it is as follows:—"In the beginning, the embryo of a Palm consists of a cellular mass of a cylindrical form, very small and not at all divided. As soon as germination commences, a certain number of cords of ligneous fibre begin to appear in the radicle, deriving their origin from the plumule. Shortly afterwards, as soon as the rudimentary leaves of the plumule begin to lengthen, spiral and dotted vessels appear in the tissue in connection with the ligneous cords; the latter increase in quantity as the plant advances in growth, shooting through the cellular tissue, and keeping parallel with the outside of the root. At the same time, the cellular tissue increases in diameter to make room for the ligneous cords (or woody bundles, as they are also called). At last a young leaf is developed, with a considerable number of such cords in connection with its base; and, as its base passes all round the plumule, these cords are consequently connected equally with the centre which that base surrounds. Within this a second leaf gradually unfolds, the cellular tissue increasing horizontally at the same time; the ligneous cords, however, soon cease to maintain anything

annual and herbaceous. Most of them attain the size and assume the aspect of trees ; a considerable number however remain shrubby, and some even have quite the appearance, but nothing save the appearance, of perennial herbs. The

like a parallel direction, but form *arcs*, the extremities of which pass upwards and downwards, losing their extremities in the leaf on the one hand, and on the other in the roots, or in the cellular integument on the outside of the first circle of cords ; at the same time the second leaf pushes the first leaf a little from the centre towards the circumference of the cone of growth. In this manner leaf after leaf is developed, the horizontal cellular system enlarging all the time, and every successive leaf, as it forms at the growing point, emitting more woody bundles, curving downwards and outwards, and consequently intersecting the older arcs at some place or other ; the result of which is that the first formed leaf will have the upper end of the arcs which belong to it longest and much stretched outwardly, while the youngest will have the arcs the straightest ; and the appearance produced in the stem will be that of a confused entanglement of woody bundles in the midst of a quantity of cellular tissue. As the stem extends its cellular tissue longitudinally while this is going on, the woody arcs are consequently in proportion long, and in fact usually appear to the eye as if almost parallel, excepting here and there, where two arcs intersect each other. As in all cases the greater number of arcs curve outwards as they descend, and eventually break up their ends into a multitude of fine divisions next the circumference, where they assist in forming a cortical integument, it will follow that the greater part of the woody matter of the stem will be collected near the circumference, while the centre, which is comparatively open, will consist chiefly of cellular tissue ; and when, as in many Palms, the stem has a limited circumference, beyond which it is its specific nature not to distend, the density of the circumference must, it is

various modifications of the trunk, or stem, determine this part of their habit; for, while the trunk of some species hardly shows itself aboveground, it attains in others the length of 500 feet; while in some it seems to have no

obvious, be proportionately augmented. It is however a mistake to suppose that the great hardness of the circumference of old Palm-wood is owing merely to the presence of augmenting matter upon a fixed circumference; this will account but little for the phenomenon. We find that the woody bundles next the circumference are larger and harder than they originally were, and consequently we must suppose that they have the power of increasing their own diameter subsequent to their first formation, and they also act as reservoirs of secretions of a hard and solid nature, after the manner of the heart-wood of Exogens. When the growth of the stem goes on in this regular manner, with no power of extending horizontally beyond a specific limited diameter, a trunk is formed, the sections of which present a singular appearance. There is a number of curved spots crowded together in a confused way, most thick and numerous at the circumference, comparatively small and thinly placed at the centre; and the only regular structure that is observable with the naked eye is that the curves always present their convexity to the circumference. Never is there any distinct column of pith, or medullary rays, or concentric arrangement of the woody arcs; nor does the cortical integument of the surface of the stems assume the character of bark, separating from the wood below it; on the contrary, as the cortical integument consists very much of the finely-divided extremities of the woody arcs, they necessarily hold it fast to the wood, of which they are themselves prolongations; and the cortical integument can only be stripped off by tearing it away from the whole surface of the wood, from which it does not separate without leaving myriads of little broken threads behind."

power to raise itself upwards, but remains a low creeping *candax*, it towers in others to the height of 200 feet, displaying a vigour altogether prodigious; while in some it is hardly as thick as a goosequill, it measures in others from three to five feet in diameter; while in some it is climbing and seeking for support among the surrounding vegetation, it exists in others quite independent of all other plants; while in some it is cylindrical and undivided (simple), it is in others—as the Doom or Gingerbread-tree of Egypt, the Palmetto of Mexico, and the Sago Palm of New Ireland—more or less forked; while in some it is perfectly smooth or even brightly polished, it is in others rough with concentric rings; and again, while in some it is armed with spines of greater or lesser length and thickness, it is in others covered with hairy fibres.

The foliage, that part of the Palms which renders them objects of such beauty and elegance, generally forms a magnificent crown at the end of the trunk. The leaves, supported on petioles, or leaf-stalks, sheathing at the base, are alternate, coriaceous, and often of such gigantic size,—measuring, as they do in some species, fifty feet in length and eight in width,—that they surpass in the latter respect those of any natural order of plants. Their structure may be summed

up in a few words:—they are simple, and furnished with a midrib, from which parallel veins branch off. This structure, best seen in some species of *Geonoma*,—*G. simplicifrons*, Willd., for instance, where it appears in all its normal simplicity,—is common to all Palms, but assumes in different species different forms, easily recognized by accomplished botanists wont to look upon the Vegetable Kingdom with a morphological eye, but not so readily traced by those who have made only a limited progress in phytological studies. In some species—as, for example, in the species of *Geonoma* just quoted—the blade of the leaves is quite entire; while in others, of which the Cocoa-nut may be cited as the type, it is cut into long segments (pinnatisect), giving it the appearance of the plume of a feather: occasionally, in the genus *Caryota*, these segments are again divided (bipinnatisect), their ultimate divisions resembling in shape the fin or tail of a fish. The midrib in these three forms, it must be observed, extends throughout the whole length of the leaves; when the contrary is the case, namely when the midrib is less developed, palmate or fan-shaped leaves are the result. This however does not happen very frequently; for, out of 582 known species, only ninety-one have fan-shaped leaves.

The leaves are green, generally on both sides, as in the

different species of *Chamædorea*, but occasionally on the under side of a silvery white, as in the *Copernicia Miraguama* and *C. cerifera*; sometimes the middle of some leaves is adorned with concentric bands of yellow and blue in the manner of a peacock's tail, as in the prickly *Mauritia*, discovered by Bonpland, on the banks of the Rio Atabapo. The direction of the leaves is a character of no less importance than that of form and colour. The segments are either ranged in a comb-like manner close to one another, with a stiff parenchyma, allowing the solar rays to play over their surface, and causing them to shine with a brilliant verdure in the Cocoa-nut Palm, and with a fainter, ashy-coloured hue in the Date-tree; or they have a more flexible, grass-like texture, and are curled near the extremity. Another peculiarity is also notable: the more acute the angle made by the leaves with the upper part of the stem—the nearer the leaves approach the perpendicular,—the bolder and nobler is the aspect of the species to which they belong. This will at once be evident by comparing the pendent leaves of the Palma de Cövija (*Copernicia tectorum*) with the more horizontal leaves of the Cocoa-nut Palm, and the lofty heavenward-pointed foliage of the Jagua, the Cucurito, and Pirijao.

• In Palms with feathery (pinnatisect) leaves the petioles either burst from the dry, rough, ligneous portion of the stem,—as, for instance, in the *Cocos nucifera* and *Phœnix dactylifera*,—or there rises in the rough part of the stem a grass-green, smooth, and thinner shaft, like one column above another, from which the leaf-stalks spring, as is the case in *Oreodora regia*. In the Fan Palms the living foliage often rests on a layer of dead leaves, imparting to the tree a character of melancholy solemnity and grandeur.

Palms, after having arrived at the proper age, flower either every year until they die, or only *once* during the whole course of their existence. The spathe, or sheath enclosing the flowers, consists of one or many valves, is occasionally of a woody texture, and presents, according to the testimony of Alexander von Humboldt and Richard Schomburgk, the curious phenomenon of bursting suddenly open with an audible report, reminding one of Pindar's Dithyrambus on Spring, and of the moment when, in the Argive Nemæa, "the first opening shoot of the Date Palm announces the coming of balmy Spring." The flowers themselves are produced on either a simple or a branched spadix, appearing in the axil of the leaves or at the end of the stem (being terminal), and in the latter instance fore-

shadowing, as Palms have not the power of forming regular side-branches, the death of the individual graced by their presence.

The flowers, supported by scaly bracts, are polygamous, or occasionally hermaphrodite; they are small and inconspicuous, generally of a white, pale-yellow, or green colour; but, as if to make up for this defect (if we may use that term), they emit sometimes a very powerful odour, which attracts such swarms of insects that a newly-burst spathe may, in most cases, be discovered by the buzzing cloud of them hovering around it; and moreover they are mostly produced in such masses as to present an eminently striking and imposing appearance. A single spathe of the Date Palm contains 12,000 male flowers; *Alfonsia amygdalina* has been computed to have 207,000 flowers in a spathe. A still greater number is observable in *Sagus Rumphii*, a single spathe of which has, according to the calculations made by Professor Agardh, Mr. Alexander Smith, and myself on one of the specimens in the Botanical Muséum at Kew, no less than 208,000 flowers, or about 624,000 upon a single tree!

The sepals,—or outer perigonial leaves, as some authors term them,—three in number, are fleshy or leathery, and

persistent; the petals, or inner perigonial leaves, alternate with, and are often larger than, the former; both calyx and corolla, or inner and outer perigonial leaves, are sometimes united throughout the greater part of their length (connate), so as to consist only of a single piece. The stamens are definite, mostly six in number; in some instances that number is trebled, and very rarely reduced to three. The filaments are quite free, or in a few exceptional cases form amongst themselves a kind of tube. The anthers are turned inwards, and two-celled. The ovary is free, and usually composed of three, or rarely of two or only one, carpellary leaves; the ovules are solitary, or occasionally in single pairs, erect, and orthotropical, or anatropal in various degrees. The styles are continuous with the carpels, and equal to them in number. The fruits, being drupaceous, or nut-like, or berried, often covered with a fibrous rind, are almost of every colour, and occasionally very numerous; a single spathe of the Seje Palm of the Orinoco bears as many as 8000 of them. Compared with the size of the plants, they are generally small; some are in this respect like peas. The common Cocoa-nut is one of the largest; and the double Cocoa-nut of the Seychelles, measuring about four feet in circumference, is probably

surpassed in its dimensions by none hitherto discovered; the seed, filling the cavity in which it grows, is often reticulated; and the albumen—of which the white fleshy part inside the Cocoa-nut may serve as an illustration—fills the kernel, and is frequently ruminate. The embryo is undivided, and conical or cylindrical.

Such is a general account of Palms,—plants which, at the present day, we associate with all that is poetical and beautiful. We introduce them frequently as rhetorical figures, and thus involuntarily bear testimony to the great influence they exercise over our minds. We speak of “palmy days” when wishing to allude to times of glory; we say of a man that “he has carried off the palm” when desiring to express his having achieved an honourable victory over an adversary; we give the name of “Palm Sunday” to the festival on which we celebrate the triumphal entry of Jesus Christ into Jerusalem, as much on account of the transcendent ideas connected with that event as on account of the palm-leaves stated to have been used on that occasion. It would be an interesting, though a difficult, inquiry to find out how long Palms have thus been associated with these and similar ideas and sentiments. The first step towards a satisfactory result in that direction

would be to endeavour answering the questions :—"How long is it since the term 'Palm' has been used as a general or collective one for the plants now called so?" "Has it, or any synonym, always been applied to them, or has that been the case only in modern times?" The latter is the most probable. The Romans—not to go further back—from whom we obtained the name, originally gave it solely, it would seem, to the dwarf Fan Palm (*Chamærops humilis*, Linn.), a plant growing in considerable abundance near the Mediterranean Sea, probably on account of a certain resemblance of its leaves to the human hand (*palma*), in the same way as the Aztecs applied to their singular *Cheirostemon platanoides*, H.B.K., the term "Macpalxochitlquahuatl," or hand-flower tree. Afterwards it appears to have been gradually extended to the other members of the Order, until it has become incorporated as a collective term with most modern European languages. The Indian Amarishina has called the Palms "Kings among Grasses," a title as objectionable as that of "Princes of the Vegetable Kingdom," but so far valuable as it shows an attempt at finding some general term for the whole of them; for although the Palms, with scarcely any exceptions, have specific names in their native countries, they

are always without any general (collective) ones, unless the latter are derived from the sources indicated. A few words will explain this circumstance. The presence of specific vernacular names in barbarous countries is a sure proof that the plants bearing them have attracted the attention of the natives, either by their noxious or useful qualities, or by their odour, colour, beauty of form, or some other peculiarities; for whenever the contrary is the case, the plants have remained without names. The absence of general vernacular terms in uncivilized countries is not confined to Palms, but is common to all other things, and proves that the nations destitute of them never had any use for them; or, in other words, they never began to generalize, never attempted to reason. This remark applies also to civilized countries, and accounts for our occasionally hearing there unthinking men expressing surprise when a fish is called an animal, and a tree a plant. If therefore we find people or persons inventing or using a general (collective) term for the plants named by us Palms, it indicates a step in popular progress towards a more perfect knowledge of them, the importance of which can scarcely be overrated. It plainly shows that they have commenced to think about them; and that is exactly

the movement which those who, from choice or compulsion, hold the office of popular instructors, are desirous of bringing about.

GEOLOGICAL AND GEOGRAPHICAL DISTRIBUTION OF PALMS.

During the last, and even the first quarter of the present century, so little was known of the structure of Palms, and all that was known appeared so abnormal to the scientific men of those days, that they were only too readily inclined to class with them almost all fossil plants presenting strange and curious forms. This remark applies with full force to *Sigillaria* and *Lepidodendron*, genera belonging to palæozoic formations; and, startling as it may be, it cannot be very surprising to us, when we consider that even in our own times notions equally erroneous prevail to an almost incredible extent. For instance, a principal share in the formation of coal is still ascribed by the generality of geologists to the Ferns, although it was proved some years ago, by a series of careful observations on numerous carboniferous formations, that such can be claimed only for the *Sigillarias* and *Stigmarias*; that merely a sub-

ordinate share is due to the *Araucarias* and *Calamites* contained in anthracite coal, and a still more insignificant one to the *Lepidodendrons*, the Ferns, and the other members of the flora of the carboniferous period.

A diligent study of the extinct flora has demonstrated that the Palms occur more rarely than was thought in the transition rocks and the carboniferous formation, and more frequently than was believed in more recent formations. Generally speaking, we know at present only trunks, leaves (both fan-shaped and pinnatisect ones), and a few fruits of the fossil Palms; flowers have not as yet been discovered, and spathes, which have been disinterred, have hitherto not been satisfactorily proved to belong to this order. These fragments, remnants of members of former creations, have been distributed under nine genera and seventy-eight species.

The classification itself is very simple. For the trunks, there have been adopted the genera *Palmacites*, Brongn. (with two species), and *Fasciculites*, Cotta (with twenty-four species), the former not differing essentially from the latter. For the leaves, the genera *Flabellaria*, Sternb. (twenty-two species), with fan-shaped leaves; *Zeugophyllites*, Brongn. (two species), with pinnatisect leaves, the segments of

which, resembling those of *Calamus* and *Desmoncus* of the present flora, are opposite, and have an unequal, well-marked nervation; *Phœnicites*, Brongn. (ten species), with pinnatisect leaves, the segments of which are opposite, and have not such strong nerves as those of *Zeugophyllites*, but they have a midrib; and *Amesoneuron*, Gœpp. (five species), with pinnated leaves, the segments of which are furnished with nerves either equally thick, or alternately thick and thin, and they are besides without a midrib,—hence the name. For the spathes, the genus *Palæospatha*, Unger (four species), which, as has already been stated, is founded upon doubtful materials. For the fruits, the genera *Bacites*, Zenk. (three species), resembling somewhat *Syagrus botryophora*, Mart., and *Castellinia*, Massalong. (six species), related, according to Massalonga (author of ‘A Synopsis of Fossil Palms’), to the *Cocoinæ* tribe of Martius. The genus *Burtinia*, Endl., placed by Unger among these plants, belongs, without a doubt, to *Nipadites*, among *Pandaneæ*.

Although our present imperfect knowledge of fossil plants renders it an almost useless task to speak of the proportion which the number of Palms bears to that of other members of the extinct flora, yet it may be re-

marked, that if the number of species of the Fossil Flora is assumed to be 4000 (there are actually at present 3945 described), Palms constitute about an eighty-fourth part of the whole.*

In the transition rocks no remnants of Palms have as yet been discovered. In the carboniferous formation five species have been noticed; in the "Kupfersandstein," or Permian formation, only two have been collected; in the secondary class of rocks, which succeeds (Keuper, Bunter Sandstein, Muschelkalk, Lias, Jura, and Wealden formation), none have been gathered, except three in the cretaceous formation, specially in the "Quadersandstein." The greatest number has been found in the tertiary class of rocks, viz. sixty, twenty-nine of which belong to the Eocene, and thirty-one to the Miocene formation. The habitat of nine species remains still unknown.

It will be seen from this synopsis that there was a geological period when Palms were entirely wanting in the extinct flora, or when, after their first appearance, they vanished again, and after a lapse of time appeared once

* Of these 4000 species 1100 belong to the Palæozoic, 538 to the Secondary, 200 to the Cretaceous formation, and according to a calculation made by Dr. Göppert in August, 1854, 2095 to the whole Tertiary class of rocks.

more: a state of things which, if confirmed, would certainly be highly curious, and is one which has never before been observed in a like manner in any large group of plants. No species is common to two formations. Several species show a remarkable degree of resemblance to those of the now existing flora, especially some of those discovered by Jung-
huhn, and described by Göppert in the 'Tertiary Flora of Java,' as, for instance, *Amesoneuron calyptrocalyx*, Gœpp., *A. dracophyllum*, Gœpp., *A. sagifolium*, Gœpp., and *A. anceps*, Gœpp. But it would be rather bold, perhaps injudicious, to attempt identifying them, from the fragments hitherto collected, with species of the present flora. The result hitherto obtained only entitles us to say:—Palms make no exception to the rule laid down, that the laws governing the Vegetable Kingdom were the same in all periods of our earth's history when plants existed; and that the species of Palms have a very local geological, as they have a very local geographical, distribution.

The Palms of our present flora may be said to be almost exclusively tropical plants, being most numerous, both in species and individuals, towards the equator, and decreasing on receding from it. Few extend their range into the warmer parts of the temperate zones, and none, it is

hardly necessary to add, venture 'within the limits of the Arctic and Antarctic Circles. The true Palm climate has a mean annual temperature of 70° to $81^{\circ} 5'$ Fahr.; but the Date Palm vegetates in the South of Europe, in districts the mean annual temperature of which is only from 59° to $62^{\circ} 4'$ Fahr. Martius has divided the Palm region into five zones, which he has named and circumscribed as follows:—The North Palm Zone, extending from the northern limit of Palms to the tropic of Cancer; the Transition North Palm Zone, from the tropic of Cancer to the 10th degree of north latitude; the Chief Palm Zone, from the 10th degree of north to the 10th degree of south latitude; the Transition Palm Zone, from the 10th degree of south latitude to the tropic of Capricorn; and the South Palm Zone, from the tropic of Capricorn to the southern limits of the family. The northern limit of Palms is, in Europe, the 43rd degree, in Asia and America the 34th degree of north latitude; the southern limit in Africa the 34th, in Australia (New Zealand) the 38th, and in America the 36th degree of south latitude. To the north of the tropic of Cancer forty-three species of Palms are known to exist; to the south of the tropic of Capricorn only thirteen. Advancing from either side towards the equator, the

number increases, until in the Chief Zone, between the 10th degree of north and south latitude, there are more than three hundred species. In the Eastern Hemisphere, the islands of the Indian Archipelago; in the Western, the valleys of the Amazon and Orinoco on the mainland, produce the greatest number of Palms. In proportion to its extent, America is the most prolific country in Palms; for while the Old World—including Europe, Asia, Africa, and Australia, with their islands—contains 307 species, the New World—that is to say, America alone—can boast of 275. In the Old World the islands produce more species than the continents, the former containing 194, the latter only 113; in the New World however the reverse is the case, the continent possessing 234, the islands only 42. The species have generally a very local geographical distribution: only a few, such as *Elæis melanococca*, *Hyphæne Thebaica*, *Acrocomia sclerocarpa*, and *Borassus flabelliformis*, possess an extensive range; but none of the species,—if we except the *Cocos nucifera* (the Coccoa-nut tree), about the native country of which there are grave doubts,—are found in a wild state in both hemispheres, rendering cosmopolitanism in this family an impossibility.

The localities in which Palms grow are as diversified as

everything else connected with these extraordinary plants.. While some are closely confined in the hotter regions of the tropics to the shores of the ocean, and are scarcely able to extend their range beyond the limits of the sea-breeze, others flourish luxuriantly far inland on the tops of mountains 14,000 feet high, and in the immediate neighbourhood of perpetual snow; while some seek the moisture, shade, and gloom of the virgin forest, others take up their abode in arid deserts, where they are exposed to the full influence of the scorching rays of an equinoctial sun; while some luxuriate in swamps, others only live in well-drained soil; while some form extensive woods by themselves, and seem to expel from their society all other large plants, others, adopting more social habits, live harmoniously in company with other members of the Vegetable Kingdom of equal size with themselves, but not in any way connected with them by ties of relationship; while some are intermingled with oaks and pines,—representatives of the flora of the temperate zones,—others keep company with *Scitamineæ*, *Ingas*, arboreous *Rubiaceæ*, tree-ferns, gigantic Arums, and epiphytical *Orchideæ*,—forms typical of the vegetation of the Tropics: in fine, almost every species grows under circumstances peculiar to itself; hence the difficulty, nay im-

possibility, of generalizing' on the habitat of the Order; but hence also the interest connected with this topic. .

How many species of Palms are scattered over the face of the globe, is still an open question. Many plains will have to be traversed, many mountains to be climbed, ere sufficient data will have been brought together for a final and satisfactory answer. Only fifteen species were known at the time of the death of Linnæus; Ruiz and Pavon added eight, while Humboldt and Bonpland described twenty new ones, and distinguished a great many more, which they named, without however being able to procure their blossoms in a perfect state, an object occasionally attended with considerable difficulties.* Of later years great

* "The difficulties," says Humboldt, "of reaching and procuring the blossoms of Palms are, in fact, greater than can well be conceived. Most of the Palms flower only once a year, and this period near the equator is generally about the months of January and February. How few travellers are likely to be in the region of Palms precisely during this season! The period of blossoming of particular trees is often limited to a few days, and the traveller commonly finds, on his arrival in the region of Palms, that the blossoms have passed away, and that the trees present only fructified ovaries, and no male flowers. In an area of 32,000 square miles, there are often not more than three or four species of Palms to be found. Who can possibly, during the brief period of flowering, simultaneously visit the various Palm regions near the Missions, on the Rio Caroni, in the Moricheles, at the mouth of the

additions have been made by the indefatigable labours of Martius, Liebmann, Griffith, D'Orbigny, Blume, Spruce, Wallich, and others, so that we are acquainted at present with about six hundred species, scarcely one half of which

Orinoco, in the valley of Cauca and Erenato, on the banks of the Atabapo and the Rio Negro, and on the declivity of the Duida? There is moreover great difficulty, when the trees grow in thick woods, or on swampy shores (as at the Jemi and Juamini), in reaching the blossoms, which are often suspended from stems, formidably armed with huge thorns, and rising to a height of between sixty and seventy feet. Those who contemplate distant travels from Europe, for the purpose of investigating subjects of natural history, picture to themselves visions of efficient shears and curved knives attached to poles, ready for securing anything that comes in their way, and of boys who, obedient to their mandates, are prepared, with a cord attached to their feet, to climb the loftiest trees. Unfortunately, scarcely any of these visions are ever realized, while the flowers are almost unattainable, owing to the great height at which they grow. In the missionary settlements of the river network of Guiana, the stranger finds himself amongst Indians who, rendered rich and independent by their apathy, their poverty, and their barbarism, cannot be induced, either by money or presents, to deviate three steps from the regular path, supposing one to exist. This stubborn indifference of the natives provokes the European so much the more from his being continually a witness of the inconceivable agility with which they will climb any height when prompted by their own inclination; as, for instance, in the pursuit of a parrot, an iguana, or a monkey, which, wounded by their arrows, saves itself from falling by its prehensile tail. In the month of Januar, the stems of the *Palma real* (*Oreodoxa regia*, H.B.K.) were covered with snow-white blossoms in all the most frequented thoroughfares of the Havana and in the

are, according to Hermann Wendland,* under cultivation in European gardens. Martius, whose authority in all matters concerning Palms is of weight, thinks that the whole number existing on our earth may amount to about one thousand species, which, considerable as it appears, may be far below the truth; I say, may be, as similar calculations have invariably been proved by our increasing stock of knowledge to be erroneous.

immediate vicinity of the city; but although we offered, for several consecutive days, a couple of piastres for a single spadix of the hermaphrodite blossoms to every Negro boy we met in the streets of Regla and Guanavacoa, it was in vain; for in the Tropics no free man will ever undertake any labour attended by fatigue, unless he is compelled to do so by imperative necessity. The botanists and painters of the Royal Spanish Commission of Natural History, under Count Don Jaruco y Mopox (Estevez, Boldo, Guio, Echeveria),* confessed to us that for several years they had been unable to examine these blossoms, owing to the absolute impossibility of obtaining them." (*A. v. Humboldt's Ansichten der Natur*). My learned friend has here stated, very circumstantially, the difficulties presenting themselves in collecting flowering specimens of Palms, but he has omitted to mention that some botanists have it perfectly in their power to escape at once from the distressing position alluded to in the latter part of his statement, namely, by themselves climbing the trees, the blossoms of which they are desirous of obtaining.

* 'Index Palmarum, Cyclantheorum, Pandanearum, Cycadearum, quæ in hortis Europæis coluntur, synonymis gravioribus interpositis. Cura Hermannî Wendland.' Hannoveræ, 1854.

CULTIVATION OF PALMS IN NORTHERN EUROPE.

Most of the Palms are too closely confined to the hotter regions of our globe to grow in the open air of cold countries like England or Germany. Only one species, *Phoenix dactylifera* of Northern Africa, has been naturalized in Italy and other parts bordering the Mediterranean Sea; and only two species, *Chamærops humilis* of Southern Europe, and *C. excelsa* of Northern China, have proved hardy in some of the milder districts of Great Britain; and although there is reason to suppose that several others may be able to bear a European winter without being injured by frost, yet the greater portion of them can only be cultivated in our latitudes under the crystal roofs of conservatories, specially built for their reception. It requires therefore, particularly as the Palms are nearly all plants of great dimensions, considerable means to become the owner of a living collection of them; and those who cannot afford to spend large sums of money have, unfortunately, to desist from the accomplishment of such an object. But the proverb, "Where there's a will there's a way," remains not without application in this instance. The admirers of Palms have discovered long ago that several species may,

in the absence of better accommodation, be grown to considerable perfection in a room; and I have a Continental friend,—a gentleman of more taste for plants than means of gratifying it,—who has devoted one corner of his study to a regular bower, composed of Date-palms, Chamædoreas, and other members of this order, all flourishing luxuriantly in company with *Dracænas*, India-rubber trees, Arums, Ivy, and Begonias. During the winter, when all nature is reposing in her icy bed, and white flakes of snow are drifted against the windows, he may often be observed sitting in that charming corner, reading, writing, or carrying on some other rational occupation, and now and then looking up, enjoying the sight of the fire blazing in the stove, and the green foliage by which he is surrounded.

Yet as even the cultivation of a few types of the order of Palms in the manner indicated is a luxury which only a limited class of people is able to enjoy, and as the number of those who possess a predilection for these elegant members of the Vegetable Kingdom is considerable, it is a matter of congratulation that in so many public and private gardens in nearly every civilized part of Europe “Palm-houses” are built, some of them of such dimensions, and their contents arranged with so much care and judgment,

as to make their visitors fancy themselves transported into the midst of those virgin forests, of which Palms, tree-ferns, and Scitamineous plants form the characteristic features. It is unnecessary at this place to inquire which of these buildings deserves to be considered as the best, and which collection is the most extensive,—the office of a Paris is one so thankless, that I can scarcely be blamed for trying to escape from it; nor is it necessary to notice the rivalry for pre-eminence observable in this respect amongst the various horticultural establishments,—a feeling to be encouraged rather than deprecated: it is sufficient for the purpose in view, to mention, as an example of a fine Palm-house, and as a noble collection of Palms, that of the Royal Botanic Gardens of Kew, an establishment which, since it has become national property and has been placed under the judicious direction of Sir W. J. Hooker, has acquired a degree of fame, completely putting into the shade that by which the “Hortus Kewensis” was formerly identified with botanical science.

The Palm-house or Palm-stove of the Royal Botanic Gardens of Kew, built from a design of Decimus Burton, Esq., was completed in the year 1848. The shell, or external frame, consists of a centre and two wings, occupying

an open area 362 feet in length; the centre is 100 feet wide, and 66 feet in height to the summit of the lantern; the wings are 50 feet wide and 30 feet high. The whole is of iron, stone, brick, and sheet-glass, the latter slightly tinged with green, to temper the too powerful rays of light. The extent of glass covering this vast building is about 45,000 square feet. The ribs, inserted in enormous blocks of Cornish granite, are placed on the most solid concrete. The central portion of the building,—a space 138 feet long and 100 feet wide,—has a substantial gallery all round, at the height of 30 feet from the floor, ascended and descended by spiral staircases, enabling visitors to view the plant from above, by bringing them on a level with the summits of many of the loftiest. The whole interior is heated by hot-water pipes and tanks, distributed under the tables and beneath the level of the floor. To avoid the ugliness of a chimney attached to so noble a structure, or even placed near it, the smoke is conveyed by an underground flue, within a brick tunnel, to a distance of 479 feet from the house, where the most part of it is consumed, and the remainder ascends by means of a shaft or ornamental tower 96 feet high, so situated and of such a form as to be an

architectural object when seen from the main walk of the Garden.*

On entering this magnificent building, the visitor suddenly finds himself in the midst of a tropical vegetation. Broad-leaved Plantains, Bananas, Strelitzias and Uranias, Feathery Bamboos, Tree-ferns and Tamarind-trees, Spiny Screw-pines and Cactuses, are mingled with numerous Palms of all dimensions and sizes; the whole being gracefully interwoven and surrounded by creeping and winding plants,—Passion-flowers, Bauhinias, Jessamines, Aristolochias, and others,—and agreeably relieved by the vivid green of densely crowded Lycopodiums, covering like turf the ground between them. The two loftiest Palms arresting the attention are species of Cocoa-nut (*Cocos plumosa* and *C. coronata*), both good examples of the extensive group bearing pinnatisect leaves; the two stoutest, a species of *Sabal* (*S. umbraculifera*), equally good examples of another less numerous group, distinguished by its fan-shaped leaves. There are besides in this collection:—the Date Palm (*Phoenix dactylifera*), producing the dates of commerce

* For further details of this fine building, see 'Kew Gardens, or a Popular Guide to the Royal Botanic Gardens of Kew.' By Sir W. J. Hooker. 12th edition. London, 1854.

and of Scripture; the Palmyra Palm (*Borassus flabelliformis*), one of the most difficult of Palms to rear; the African Oil-palm (*Elæis Guineensis*), which yields Palm-oil; the Cocoa-nut (*Cocos nucifera*), the uses of which are said to be more numerous than the days of the year; the American Cabbage Palm (*Oreodoxa oleracea*), the young leaves of which are an excellent esculent vegetable; the Betel-nut tree (*Areca Catechu*); the Wild Date of India (*Phoenix sylvestris*), supplying Palm-wine and sugar; the Ivory-plant (*Phytelphas macrocarpa*), the seeds of which resemble animal ivory in appearance; the Wax Palm of the Andes (*Ceroxylon andicola*), of which the full-grown stem is covered with a waxy substance; and lastly the Broom Palm (*Attalea funifera*), the coarse fibre of which is used for making brooms and brushes.

It would lead us too far, and we should be obliged to anticipate too much of what is about to be discussed in the following pages, were we to extend our sketch of this remarkable collection. Enough has been said to convince the student of Palms that the Great Conservatory in the Royal Botanic Gardens at Kew is a place worthy of his attention; and a school where much valuable information may be obtained. For the purposes of study, no doubt a

bright sunny day is to be recommended; but to see the Palms to their greatest advantage, in an æsthetic point of view, a dull or rainy day should be selected, especially when the shades of evening are approaching,—a time when they always look best, owing partly in Kew to some local causes,* but principally to the fact that the generality of Palms are intended for the gloom of the virgin forest, and are therefore, like some pictures, not well adapted for bright and strong lights. If at such a time the visitor will take up his position in the gallery, and cast his eye upon the thick foliage filling the vast area of the building, his thoughts cannot help wandering to those far-off regions whence the beautiful objects before him have with so much difficulty and care been imported. If he know anything of the history of botany, the names of Humboldt, Wallich, Bonpland, J. D. Hooker, Purdie, Wilson, Griffith, Linden, Hartweg, and others, who, disregarding dangers and mental and bodily exertions, explored trackless forests, climbed steep mountains, traversed pestilential swamps—the abode of myriads

* The plants, having to be syringed with water from the Thames, which is charged with a considerable quantity of alluvium, are covered with a minute crust of dust, hardly seen when they are moist, as in the evenings, when the process of syringing is applied, or on damp days, but rather conspicuous when they are quite dry, which is always the case during clear weather.

of mosquitos,—and crossed dreary deserts and monotonous steppes, will flash before his memory as having been instrumental in bringing together this magnificent collection,—magnificent from its numerical size, its excellent condition, and its noble associations: and whilst admiring the heroism displayed by them in facing savage people and ferocious animals often obstructing their passage, and the patient endurance they exhibited in dragging scarce plants from the entangled masses of virgin forests and the remote recesses of the highest mountains, he cannot but feel grateful to those men who thus strove to satiate that irresistible thirst for knowledge felt by every human being, laboured so strenuously towards completing the grand survey of those finite things, calculated in such eminent degree to inspire us with love and reverence for the infinite! Gradually, whilst giving rise to such and similar reflections, the verdant masses will assume before his mind's eye more extensive dimensions than they actually possess, become endless forests, where strange animals and barbarous people have taken up their abode. The more he looks, the more new beauties, fresh charms, will be revealed; and the more he reflects, the more uses, the more properties beneficial to mankind, will be discovered; until, fully impressed with the

grandeur of the subject before him, he will exclaim:—
“What a pity that our northern countries are deprived of Palms, plants alike beautiful and useful! I wonder why this is,—why a country should not be able to supply all the wants of its own people, and thus ensure the perfect independence of one nation from another. Why have we to go to Africa for our dates, to America for our cocoa-nuts, and to Asia for our sago?” Nature does nothing without an object, and must, in acting thus, have intended to convey a lesson. What can that lesson be? A great and glorious one, repeated in all her works, even in the smallest details! She has never lavished on one country all the productions which its inhabitants require, nor heaped—to quote another instance—upon an individual human being all the talents and beauties of our species, though she may have been occasionally extremely liberal, but sown them broadcast over the whole face of the earth, divided them judiciously amongst the whole race of man. She has, by distributing her gifts in such a manner, wished to point out the mutual dependency of one country or one man upon another, thus practically teaching us peace, humility, love!—the three great watchwords, without which human society cannot prosper, and human happiness becomes an impossibility.

DETAILED ACCOUNT OF THE PALMS.

Genus I. ACROCOMIA, *Martius*.

THE traveller in tropical America, after disentangling himself from the dense jungle of the virgin forests, and entering once more the open country,—the campos, savanas, llanos, prairies, and pampas,—often finds the landscape dotted with Palms, which a closer inspection readily identifies with those occasionally seen on the banks of rivers bordering the forests just left behind. Their stem, seldom exceeding the height of fifty feet, is often swollen in the middle, and clad, as are the petioles and spathes, with long brown or black spines; their leaves, forming a dense crown at the top of the trunk, are pinnatisect, of a lively green, and considerable dimensions; their spathes, appearing between the lower leaves, enclose a simply-branched spadix, bearing small green or yellow flowers; and their fruits (drupes) are round, of a greenish-olive, and contain dark-coloured nuts. These Palms belong to the genus *Acrocomia* of Martius.

They have long been known to botanists, being mentioned by Aublet, Gärtner, and Jacquin; and have always, it would seem, been familiar to the natives of the districts in which they grow, as all of them, principally on account of the oil extractable from their nuts, are of considerable value in domestic economy. About seven different species have been recognized in systematic works, three of which, *A. Cubensis*, Lodd., *A. lasiospatha*, Mart., and *A. sclerocarpa*, Mart., have been introduced into European gardens; but that number will probably have to be reduced, as the differences between them insisted on by some authors, appear to be of too insignificant a nature ever to receive the general sanction of the botanical world.

The different species are known in their native countries by the names of Macaja, Macajah, Macaw, Macoja, Macahuba, Macauba, Mocaja, and Mucuja, all variations of one original term, the diffusion of which over the West Indies and the whole eastern part of South America, shows that there is a very striking habitual character in this genus, or else the semi-barbarous people who apply it would never have been able to trace these Palms over so extensive a tract of land. The most important species of *Acrocomia* is *A. sclerocarpa*, Mart. (*A. aculeata*, Lodd., *vide* J. Smith,

Cocos fusiformis, Swartz, *C. aculeata*, Jacq., *Bactris globosa* (*minor*), Gærtn., *Geonoma Pohliana*, Hortic.), the Great Macaw-tree of the West Indies, the Macoya of the Guianas, and the Macahuba of the Brazils : a Palm occurring in considerable abundance in Jamaica, Trinidad, and the adjacent islands, as well as the eastern parts of South America as far as the latitude of Rio Janeiro. It is from twenty to thirty feet high, has leaves measuring from ten to fifteen feet in length, and bears a fruit, the nut of which, susceptible of a very high polish, is sometimes fancifully carved by the Negroes. It is on account of the fruit, which yields oil, that the Great Macaw-tree becomes notable. The oil is extracted by the following process:—The fruit, having been slightly roasted, is ground to a paste, first in a mill and then on a levigating stone. This paste, having been gently heated and mixed with three-tenths of its weight of boiling water, is put into a bag, and pressed between two heated plates of iron : it yields about seven-tenths or eight-tenths of oil. The oil, if discoloured, can be purified, when melted by filtration. It is then of the consistence of butter, of a golden yellow hue, has an odour like violets, and a sweetish taste. If well preserved, it will keep several years ; if spoiled, it loses its golden hue and delightful aroma. It

is frequently sold in the shops as "Palm-oil," and at present enters largely into the composition of toilet soaps. As an emollient it is considered to be useful in some painful affections of the joints: the Negroes deem it a sovereign remedy for "bone-ache."

Less important in an economical point of view is *Acrocomia lasiospatha*, Mart., the Mucuja of the Brazilians; a tree which, according to Wallace,* is common in the neighbourhood of Pará, but which is also found in various other parts of Brazil. Its trunk is about forty feet high, smooth, and ringed; its leaves are drooping; its fruit, which is of the size of an apricot, globular, and of a greenish-olive colour, has a thin layer of firm edible pulp (mesocarpium), of an orange colour, covering the nut (putamen), and which, though oily and bitter, is much esteemed and eagerly sought after by the natives.

Of still less importance than the foregoing species is *Acrocomia Mexicana*, Karwinsky (*A. Zapotecis*, Jangangha), of which my friend Professor C. B. Heller says (Bonplandia, vol. ii. p. 157), "I met with this noble tree, vernacularly termed 'Coyoli,' repeatedly in Tabasco and Chiapas, two

* 'The Palm-trees of the Amazon and their Uses.' By Alfred Russel Wallace. With forty-eight plates. London, 1853.

states particularly rich in Palms, growing isolated on the slopes of hills, but more frequently on the banks of rivers. The trunk, which is from twenty to thirty feet high, and from six inches to a foot in diameter, bears a magnificent and very regular crown of leaves, often seen above the tops of the surrounding trees. The fruit, which is termed 'Coquito habroso,' is eaten by the inhabitants, but not much esteemed."

Genus II. ARECA, *Linnaeus*.

The European, when beholding for the first time the Bengalese, or still more the Malays and Burmese, cannot help noticing, with a feeling of regret, mingled with disgust, the offensive appearance of their mouths, their brick-red lips, and their black teeth,—discolourments brought about by chewing the Betel or Areca-nut, together with lime, tobacco, gambir (an astringent substance extracted from the foliage of *Uncaria Gambir*, Roxb.), and the leaves of various species of pepper. The plant yielding it belongs to *Areca*, a genus composed of about twenty species, unarmed trees, inhabiting the Eastern hemisphere, chiefly the islands; generally growing in groups, and always produ-

cing slender, annulated trunks, about fifty feet high, and crowned with elegant pinnatisect leaves, having linear, entire segments, and bunches of drupes, containing single seeds, scarcely ever larger than a hen's egg. *Areca Catechu*, Willd., the well-known Betel or Areca-nut Palm, from which the genus takes its name, and which the Hindoo poets have likened to "an arrow shot from heaven," is cultivated throughout the East Indies, especially towards the sea-coast, near which alone it comes to perfection. It is termed in Sanscrit *Goorvaka*, in Bengalee *Gooa*, in Arabic *Foolful*, in Persian and Hindustance *Soopara*, in Telingee *Poka Chelloo*, in Malayan *Pinang*, and in the languages spoken in the Philippine Islands *Bonga* and *Luyos*. As is the case with all plants which have been long in cultivation, a great many varieties of this tree exist, all of which are distinguished by the natives by particular names, meriting, as Griffith justly observes, as much attention as those of the Cocoa-nut. The Betel-nut tree has been well described by various authors, but perhaps in the most popular manner by Bennett, in his 'Wanderings,'* who, when speaking of Sumatra and its productions, says:—

* 'Wanderings in New South Wales, Batavia, Pedir Coast, Singapore, and China,' etc. By George Bennett. London, 1834.

“The Areca Palm is of elegant growth, rising with a very erect and slender trunk to the height of forty or even sixty feet, the summit terminating in a tuft of dark-green foliage; the trunk is seldom more than eighteen inches to two feet in circumference; when young of dark-green, and when old of a dark-grey colour; the circles formed by the clasping petioles of the leaves being very visible upon it. The fruit ripens only once during the year, at which period the tree, with its long bunches of orange oval-shaped fruit, pendent from the upper part of the trunk, contrasted by the dark-green foliage, has a beautiful appearance. The Areca-nut, when planted, takes three years to arrive at a sufficient size to produce fruit. Each fruit is about the size of a small hen's egg; the external covering (*sarcocarpium*) is thick and fibrous, which, on being cleared away, shows the nut surrounded by its shell (*putamen*), often difficult of removal. The nut is conical, but varies, in some having an elevated apex and small base, in others a large base and very slightly elevated apex.

“Many of the common drinking and baking utensils in the boats, and vessels for holding water, not dissimilar to those made by the Australian natives from the bark of the Gum-trees (*Eucalypti*), are made from the spathe; it is also

nailed upon the bottoms of the boats, and I have often seen, on this coast, as well as in Java, small bunches of the abortive fruit placed as an ornament at the stern and bows of the native boats.

“The nuts vary in size; their quality however does not at all depend upon this property, but upon their internal appearance when cut, intimating the quantity of astringent matter contained in them. If the white or medullary portion, which intersects the red or astringent part, be small, has assumed a bluish tinge, and the astringent part is very red, the nut is considered of good quality; but when the medullary portion is in large quantity, the nut is considered more mature, and, not possessing as much astringency, is not esteemed so valuable.

“The quantity of nuts produced on the coast of Sumatra is stated to be 80,000 piculs.* When there is no immediate demand for this article, it is not shelled, but preserved in the husk, as it is considered not to be so liable to be destroyed by the worm in that state; but I have seen nuts destroyed totally by the worm, while in the husk, in the space of two months. The produce of the first month or month and a half, amounting usually to 40,000 piculs, the natives

* One picul = $133\frac{1}{3}$ lbs. English.

informed me, is exported; and the second gathering, amounting to about the same quantity, is consumed in the country."

When speaking of Southern China, the same author says :—"The quantity of Arcca-nut imported by the Chinese amounts to 45,000 or 48,000 piculs annually, exclusive of that brought from Cochin China, the amount of which is not known. In 1832, from a failure of the usual supply of nuts from Cochin China, 48,000 piculs, imported from other places, sold so high as $4\frac{3}{4}$ dollars the picul; the price it usually fetches in the China market is from 2 dollars to $3\frac{3}{4}$ dollars the picul. The principal consumption of the nut as a masticatory, in conjunction with the leaf called betel, produced from a Pepper-vine (the *Piper Belle*, Linn.), is in the provinces of Quang-tong (Canton of Europeans), Quang-si, and Che-keang, and it may be seen exposed for sale, on little stalls, about the suburbs of Canton, with the other additional articles used in the preparation; it is also used as a mordant for coarse dyes. The Arcca-nuts brought from Cochin China are considered by the Chinese the best imported. This may however arise from prejudice in favour of a country so nearly allied to them. In the central provinces of Hoo-kwang and Kiang-si, the nut is, after being bruised and pounded, mixed with the green food of

horses, as a preventive against diarrhoea, to which that kind of food sometimes subjects them. It was likewise mentioned to me by a Chinese, that it is used as a domestic medicine in the north of China, small pieces being boiled, and the decoction administered in various visceral affections.

“A cargo of this article generates so much heat as to raise the thermometer in the hold of a ship 40° above that on deck; and from this circumstance, and the quantity of steam generated, the crew are prevented from sleeping between decks.

“The Arcca-nut is commonly known in Southern China by the very prevailing Malay name of *Pinang* or *Pinong*, but in the Achenese language it is called *Pénu*, and the tree *Ba pénu*. The ripe Arcca-nut is called also *Pénu massa*, and the green, *Pénu mudr*; the Gambir used with the Betel, *Gambé*; the Betel-leaf, *Ránu*; and the lime, *Gáñu*; the tobacco, *Bákun*.

“The mastication of the Betel is considered very wholesome by those who are in the habit of using it. It may be so; but the black appearance it gives to the teeth, although it is said to be an excellent preserver of them, together with the brick-red lips and mouth, give anything but an agreeable appearance. Its use certainly does not im-

part additional beauty to the native females, who habituate themselves to an equal extent to those of the opposite sex."

When in Singapore, I often saw the Malays chewing the Betel-nut, together with gambir, tobacco, lime, and the leaves of the Siri (*Piper Siriboa*, L.), and the Chinese practising the same filthy habit, with the only difference that they used the foliage of the black pepper (*Piper nigrum*, L.), instead of that of the Siri. This statement however applies only to the Chinese colonists in the island; in the southern parts of the Celestial Empire, the people avail themselves of the leaves of *Piper Betle*, L. Though the quantity of tannin contained in the Betel-nut must exercise an injurious influence, yet it is a mistake to suppose that the mere chewing of it gives to the mouth an offensive appearance; unless the other ingredients are added, the saliva hardly changes its natural colour.*

Low, in his 'Borneo,' says:—"The graceful Betel or Areca-nut Palms do not grow in such abundance in Borneo as to form an article of exportation; on the contrary, large

* In this remark I am fully borne out by Bennett and Blanco, the latter of whom states: "Es digno de notarse que el compuesta de la bonga, del buyo, y de la cal, hace la saliva encarnada, y no sucede esto, cuando falta alguna de las tres cosas."

quantities are imported ; for, like the Cocoa-nut trees, they were destroyed during the wars which, previous to Sir James Brooke's arrival, desolated the country. The nut is only used for chewing,—a practice universal in the Indian Archipelago. The male flowers are deliciously fragrant ; they are in request for all festive occasions, and are also considered a necessary ingredient in the medicines and charms employed for healing the sick."

Manuel Blanco* gives a detailed account of this Palm in the Philippine Islands, in which the following passages occur:—"I think the Areca might be used for making red ink, and it is not improbable that it is already thus employed in India. . . . In combination with the Alparroso it makes black ink, which however is inferior to that obtained from the Aroma (*Acacia Farnesiana*, Willd.). The lower part of the petiole, vernacularly termed 'talupac,' is very clean, white, and flexible, and serves for wrapping up things, and for other purposes, on account of which it is sold by the natives. The heart of the leaves is eaten as a salad, and has not a bad flavour ; but, gathering it, the tree dies. When the natives are in want of Areca-nuts for chewing they use as a substitute the bark of the Gua-

* 'Flora de las Filipinas,' etc. Por Manuel Blanco. Manilla, 1845.

yabo (*Psidium Guayaba*, Raddi), or that of the Antipolo." The same necessity seems to compel various other Asiatics to have recourse to different other species of *Areca*; for instance, the convicts confined on the Andaman Islands use the nuts of *Areca laxa*, Hamilt.; the Nagas and Abors of eastern Bengal use those of *A. Nagensis*, Griff.; and the natives of the mountainous districts of Malabar those of *A. Dicksoni*, Roxb., instead of those of *A. Catechu*, Linn. So much are these people attached to the Betel-nut, that they would rather forego meat and drink than relinquish the mastication of it. They entertain the notion that by means of it the teeth are fastened, the gums cleansed, and the mouth cooled, and this notion, unfounded as it is, may in some degree have influenced those Europeans who, of late years, have recommended Areca-nut charcoal as a tooth-powder; at least, so far as we know, it can have no particular value over ordinary charcoal, except perhaps that derived from its greater hardness.* On account of the

* It is very doubtful whether any of the extracts called *Catechu* are derived from *Areca Catechu*, Linn. Blume (Rumphia, vol. ii. p. 67) denies it altogether, and says that the error has arisen from the circumstance that old and dry Areca-nuts, broken in small pieces, are macerated in rose-water in which Catechu has been dissolved. J. D. Hooker, T. Thomson, and myself have never seen Catechu as prepared from Betel-nuts. Pereira (Elements of

large quantity of tannin which these nuts contain, they have been employed in some parts of India for dyeing cotton cloths; some medical men also consider them useful in cases of dysentery. In Malabar an inebriating lozenge is prepared from the sap of the tree, and in Khasia the natives measure distances, according to Dr. J. D. Hooker's statement, by the number of mouthfuls of Betel-nut chewed on the road.

The exact native country of the Betel-nut is unknown, but is supposed to be the Sunda Islands; the tree from time immemorial has been extensively cultivated in all parts of the East Indies, so that we are at present unable to trace it back to the spot whence it originally may be supposed

Materia Medica, vol. ii. part i. p. 1045, ed. iii), speaking of Areca-nut Catechu, says:—"In the southern parts of India, and probably in Ceylon, an extract called Catechu is procured from Areca-nuts. The mode of preparing it has been described by Herbert de Jäger and Heyne. The last-mentioned author states that it is largely procured in Mysore, about Sirah, in the following manner:—'Areca-nuts are taken as they come from the tree, and boiled for some hours in an iron vessel. They are then taken out, and the remaining water is inspissated by continued boiling. This process furnishes *Kassu*, or most stringent *Terra Japonica*, which is black, and mixed with paddy (rice) husks and other impurities. After the nuts are dried, they are put in a fresh quantity of water, boiled again, and the water, being inspissated, like the former, yields the best or dearest kind of Catechu, called *Coury*. It is yellowish-brown, has an earthy fracture, and is free from

to have come. It has also found its way into European gardens, where it is grown, together with *Areca alba*, Bory, *A. sapida*, Soland., *A. crinita*, Mart., *A. Madagascariensis*, Mart. (from the ashes of which the natives of Madagascar extract salt), *A. monostachya*, Mart. (*Livistonia inermis*, Hort., and *Seafurthia præmorsa*, Hort.), *A. pumila*, Mart. (*Pinanga Nenga*, Bl.), *A. rubra*, Bory (*Euterpe globosa* and *E. pisifera*, Hort.), and *A. triandra*, Roxb.,—plants of great beauty, but possessing, except *A. sapida*, few peculiarities which entitle them to a special notice in a work of such limited extent as the present. *A. sapida*, Soland. (*A. Banksii*, Mart., *A. sapida*, Banks et Soland., *Kentia sapida*, Mart.) deserves consideration, on account of its being the southernmost of all

the admixture of foreign bodies.’ None of the extracts brought from India, under the denomination of Catechu, are distinguished by any name by which they can be referred to the Areca-nut. It is probable, however, that some of those which come over in the form of *round and flat cakes*, and also *in balls*, and which are more or less covered with paddy husks, are obtained from this seed. A decoction of some of these kinds of Catechu yields, when cold, a blue colour on the addition of iodine, indicating the presence of starch. The presence of fatty matter in them is considered by Guibourt to be a proof that the Areca-nut has been employed in their production. “I think it is probable that the Colombo or Ceylon Catechu of commerce, in the form of round flat cakes, covered by paddy husks, is the *Kassu* of Heyne; and Guibourt is of opinion that the *dull reddish Catechu in balls*, partially covered by paddy husks, is the *Coury* of Heyne.” Compare also genus *Borassus*.

Palms,—found in New Zealand as far as latitude $38^{\circ} 22'$ south. It is, according to J. D. Hooker (Flora of New Zealand, vol. ii. p. 261), a small Palm, the trunk of which is from six to ten feet high, and six to eight inches in diameter, bearing leaves from four to six feet long, and a glabrous, much-branched, densely flowered spadix, enclosed in two boat-shaped spathes. It grows principally in the Northern Island and the north part of the Middle Island, where the natives, who eat the young inflorescence, term it “Nikau.” As there exists in most works a great deal of confusion amongst the synonyms of this plant, I cannot do better than make an extract from the excellent Flora quoted, in which J. D. Hooker has set this perplexing subject, it is to be hoped, finally at rest. “Mr. Allan Cunningham has applied to this Palm Endlicher’s description, drawn up from Ferdinand Bauer’s drawings of Norfolk Island specimens. This does not agree with the New Zealand plant in the shape of the drupe, which is said to be globose in the Norfolk Island species. Mr. John Smith, curator of the Royal Botanic Gardens at Kew, has both in cultivation, and has shown me a very considerable difference in habit and in the breadth of the segments of their leaves, those of the Norfolk Island Palm being twice as broad as

those of the New Zealand one; but there is great variation in these respects with both species. Dr. von Martius also separates them, but gives Forster's name to the Norfolk Island plant, whereas Forster figured the New Zealand one only, to which the name *sapida* must remain attached, whilst that of *Baueri* may be given to the Norfolk Island species, if it should prove really distinct. There is as much difference between the narrow and broad segments of specimens of *A. sapida*, growing in Kew Gardens, as between the latter and those of *A. Baueri*."

Genus III. ARENGA, *La Billardière*.

This genus numbers at present, if we exclude the doubtful *Arenga Manillensis* (*Saguerus Manillensis*) of the gardens, five species—*A. obtusifolia*, Mart. (*Gomutus obtusifolius*, Blume, *Saguerus Langkab*, Blume), *A. saccharifera*, Labill., *A. Westerhoutii*, Griff., *A. Wightii*, Griff., and *A. Griffithii*, Seem.,* all of which are handsome trees. Their trunks are

* I have given this name to the species from the second Kiouk-dweng, or mountain defile, of the Irawaddy, described, but not named, at p. 168 of Griffith's 'Palms of British India,' the northernmost species of the genus hitherto discovered, growing in company with *Hæmatospermum*, *Dillenia*, *Campanula*, and *Æsculus*.

ringed, and occasionally decumbent; their petioles are furnished with copious black, rigid fibres, and they are sometimes prickly; their leaves are pinnatisect, the segments of which being linear, often with lobed bases, and more or less toothed and divided apices, and always dark green on the upper, and dirty white on the under surface. All *Arengas* flower only once during the term of their existence. Their spikes are pendulous, often in bundles like the tail of a horse; their flowers are large, monœcious, and generally, but not always, in different spadices; their stamens are indefinite, their ovary trilocular, and their fruit, a green and round berry, is depressed and three-cornered at the apex, imperfectly three-lobed and three-seeded. They chiefly inhabit the islands of the Indian Archipelago, but are also met with on the Asiatic continent; their favourite localities being dense shady forests and the neighbourhood of rivers and rivulets.

The genus, though composed of several species, is rendered famous by only one—the *Arenga saccharifera*, Labill. (*Saguerus Rumphii*, Roxb., *Borassus Gomutus*, Lour., *Gomutus saccharifera*, Spr.), which occurs in great abundance in a wild state throughout the islands of the Indian Archipelago, but is more common in the interior, principally in

the hilly districts, than on the sea-coast, and it is also very generally cultivated by the various people who inhabit that region. It has been called one of the most useful of all the Palms; and how well it deserves that epithet may be judged from a perusal of the accounts published by Roxburgh, Griffith, Marsden, Low, and, above all, by Crawford.* Like all plants enjoying a wide geographical distribution, this tree is distinguished by names as numerous as the languages of the countries which claim it as a member of their flora. With the usual copiousness of these languages on similar occasions, each useful part of the plant is designated by a special name. In Malay the tree is called *Anao* (*Anore* according to Griffith, and *Anau* according to Bennett), the liquor (toddy) obtained from it *Turak* or *Nera*, the soft brown scurf found at the base of the petioles *Barum* (*Baru*?), and the horsehair-like material covering the latter *Iju* (*Ejoo* or *Eju*) or *Gomuti*. It is this last name which some botanists have applied as a generic, others as a specific one to the whole plant. In Javanese the tree is called *Aren*, the material like horsehair *Duk* (occasionally spelt *Doh*), the gossamer-like substance *Kawul*, and the sap *Lagen*, which means the *sweet* material by distinction. In the

* History of the Indian Archipelago. London, 1820.

Amboynese language the tree is called *Nawa*, the horsehair-like material *Makse*. In the Ternati language the tree is called *Seho*, in the Bali *Jahaka*, and in the Bima *Naun*. In the Macassar language the tree is termed *Monchono*, the sap or toddy *Juro*; and in the Mandar, the former *Akel* and the latter *Ki*. The Portuguese, and other European nations following their example, call the tree and its liquor *Sagwire*, though no one knows for what reason.

The Sagwire or Gomuti—we had better adopt the latter name, as being the most euphonious—attains a height of thirty to forty feet, is without spines, and bears a dense crown of pinnatisect leaves, which have rather a sombre aspect; their segments are generally fasciculate, the middle ones five feet long, about four inches broad, linear-ensiform, dark green above, white underneath, with distant spinescent teeth, and a bilobed or bifid, ceroso-dentate apex. When very young, they are caten, like those of the American Cabbage Palm (*Oreodoxa oleracea*, Mart.). The petioles are very stout, and it is at the base of these, and completely embracing the trunk of the tree, where the horsehair-like material, which co-operates to render this Palm so valuable, is produced. This fibrous substance, superior in quality, cheapness, and durability to that obtained from the husk of the

Cocoa-nut, and renowned for its power of resisting wet, is used by the natives of the Indian islands for every purpose of cordage, domestic and naval, a practice in which Europeans have of late years imitated them. The coarser parts—or “small twigs,” as some authors call them—found with this “vegetable horsehair,” are used by all the tribes who write on paper as pens, and they are the arrows used by others to discharge, poisoned or otherwise, from blow-pipes or arrow-tubes. Underneath this material is found a substance of a soft gossamer-like texture, which is imported into China. It is applied as oakum in caulking the seams of ships, and more generally as tinder for kindling fire: it is for this latter purpose that it is chiefly in request among the Chinese.

The substance of the foregoing account of this fibre is chiefly derived from Crawford, but he is not the only author who bears testimony of its excellence and value. Marsden, in his ‘Sumatra,’ says:—“It is bound on as a thatch, in the same manner we do straw, and not unfrequently over the *galoompye* (bamboo thatch); in which case the roof is so durable as never to require renewal, the Ejoo being of all vegetable substances the least prone to decay; and for this reason it is a common practice to wrap a quantity

of it round the ends of timber or posts which are to be fixed in the ground. . . . The Ejoo exactly resembles coarse black horsehair, and is used like it, among other purposes, for making ropes, and mixing with mortar." Low, in his 'Borneo,' whilst corroborating this statement, adds:—"The hairy filaments are plaited by the natives into ornaments for the arms, legs, and neck, which are more pleasing in their deep black hue and neat appearance (at least to eyes of Europeans), than the beads and brass with which these people are fond of adorning their persons." Bennett, in his 'Wanderings,' also gives a highly favourable description of this fibre, and throws out the suggestion that it may be the same as that called "Cabo negro" by the Spaniards at Manilla.

The principal production of the Gomuti Palm is the toddy,* which, according to Crawford, is procured in the following manner:—One of the spadices is, on the first appearance of fruit, beaten on three successive days with a small stick, with the view of determining the sap to the wounded part. The spadix is then cut off a little way from its root (base), and the liquor which pours out is received in pots of earthenware, in bamboos, or other vessels. The

* Derived from the Sanscrit word "*Tide*."

Gomuti Palm is fit to yield toddy when nine or ten years old, and continues to yield it for two years, at the average rate of three quarts a day. When newly drawn the liquor is clear, and in taste resembles fresh must. In a very short time it becomes turbid, whitish, and somewhat acid, and quickly runs into the vinous fermentation, acquiring an intoxicating quality. In this state great quantities are consumed; a still larger quantity is immediately applied to the purpose of yielding sugar. With this view the liquor is boiled to a syrup, and thrown out to cool in small vessels, the form of which it takes, and in this shape it is sold in the markets. This sugar is of a dark colour and greasy consistence, with a peculiar flavour: it is the only sugar used by the native population. The wine of this Palm is also used by the Chinese residing in the Indian Islands in the preparation of the celebrated Batavian arrack.

In Malacca, the Gomuti, there termed Kabong, is cultivated principally for the juice which it yields, for the manufacture of jaggery (sugar). The 'Journal of the Indian Archipelago' for November, 1849, says:—"Like the Cocoa-nut tree, it comes into bearing after the seventh year. It produces two kinds of mayams or spadices—male and female. The female spadix yields fruit, but no juice, and

the male *vice versa*. Some trees will produce five or six female spadices before they yield a single male one, and such trees are considered unprofitable by the toddy collectors; but it is said that in this case they yield sago equal in quality, though not in quantity, to the *Cycas circinalis*, although it is not always put to such a requisition by the natives; others will produce only one or two female spadices, and the rest male, from each of which the quantity of juice extracted is the same as that obtained from ten coconut spadices. A single tree will yield in one day sufficient juice for the manufacture of five bundles of jaggery, valued at two cents each. The number of mayams shooting out at any one time may be averaged at two, although three is not an uncommon case. When sickness or other occupation prevents the owner from manufacturing jaggery, the juice is put into a jar, where, in a few days, it is converted into excellent vinegar, equal in strength to that produced by the vinous fermentation of Europe. Each mayam will yield toddy for at least three months, often for five, and fresh mayams make their appearance before the old ones are exhausted; in this way a tree is kept in a state of productiveness for a number of years, the first mayam opening at the top of the stem, the next lower down, and so

on, until at last it yields, one at the bottom of the trunk, with which the tree terminates its existence." The fruit, according to Crawford, is about the size of a medlar, and produced in such abundance that a single spadix is more than a load for a man. The fleshy outer covering of the fruit affords a juice of a highly stimulating and corrosive nature, which, when applied to the skin, occasions great pain and inflammation. The inhabitants of the Moluccas were in the practice of using, in their wars, in the defence of posts, a liquor afforded by the maceration of this fruit, which the Dutch appropriately denominated "hell-water." The seed, or rather the albumen, freed from this noxious covering, is made into sweetmeat by the Chinese.

Like the true Sago-palm, continues the last quoted author, the Gomuti affords a medullary matter, from which a farina is prepared. In Java, it is the only source of this substance, which in the western and poorer part of the island is used in considerable quantity, and offered for sale in all the markets. It is smaller in quantity than the pith of the true Sago-tree, more difficult to extract, and inferior in quality; having a certain peculiar flavour, from which the farina of the true sago is free.

Griffith, who has given a good description and figure

of this Palm, says:—"Mr. Lewis informs me that trees that have died after the ripening of the whole crop of fruit,—which is the natural course of events,—are almost hollow, and particularly adapted for making troughs, spouts, or channels for water, and that they last extremely well underground. In short, it is so valuable a Palm, that it early attracted Dr. Roxburgh's attention, who introduced it largely into Hindostan. The natives of Bengal however have never taken to it, preferring the coir of the Cocoa-nut, and the toddy and sugar of *Phoenix sylvestris*. The following are Dr. Roxburgh's words:—"With respect to the various important uses of this most elegant Palm, I have nothing to offer myself, but refer to what Rumphius and Marsden have written on the subject. At the same time, I cannot avoid recommending to every one who possesses land in India, particularly such as is low and near the coasts, to extend the cultivation thereof as much as possible. The wine itself and the sugar it yields, the black fibres for cables and cordage, and the pith for sago, independent of many other uses, are objects of very great importance.

"From observations made in the Botanic Garden at Calcutta, well-grown, thriving trees produce about six leaves annually, and each leaf yields from eight to sixteen ounces

of the clean fibres. In the same garden there are now (1810) many thousand plants and young trees, some of them of above twenty years' growth, with trunks as thick as a stout man's body, and from twenty to thirty feet high, exclusive of foliage. They are in blossom all the year; one of them was lately cut down, and yielded about 150 lbs. of good sago-meal.'"

Genus IV. ASTROCARYUM, G. F. W. Meyer.

"There is no rose without thorns," and, it may be added, no *Astrocaryum* without spines. Trunk, foliage, fruit-stalks, spathes, and, in some cases, even the fruit of every species of this genus are armed with acute spines. It has been said that thorny and spiny plants are indicative of a poor soil or an arid climate, but that induction, though holding good as a general rule, is, like all such rules, subject to particular exceptions, and the genus *Astrocaryum* is one of them. Instead of growing as, according to *our* rules it ought to do, in a meagre soil, or a country rarely visited by vivifying rains and refreshing dews, it is generally found in moist places, often on the banks of rivers, exposed to occasional floods,

in virgin forest, luxuriating in rich vegetable mould. *Astrocaryum* is composed of about sixteen species, natives of the north-eastern parts of South America, chiefly Brazil. They resemble in habit, as well as in every other respect, the various *Acrocomias*; most of them are trees, some attaining the height of forty feet; and only a few, as, for instance, *A. acaulis*, Mart., the Iú of the Brazilians, stemless plants. Their trunks are covered with rings of black or dark brown spines, occasionally a foot long; their leaves, which are terminal, pinnatisect, and have linear, entire segments, of a dark-green above, and generally of a silvery-white underneath, form a dense crown, from the lower parts of which, generally from the axils of the old decayed leaves, the spathes are developed. The latter, during the flowering season, are in most cases erect, but finally, when the fruit has increased in size and weight, they always hang down; their flowers, appearing in simple or branched spadices, are yellowish or green; their drupes are round and oval, of a yellow or orange colour, occasionally agreeably scented, and contain solitary stony seeds. We cultivate in our gardens, as far as I have been able to ascertain, seven species of *Astrocaryum*, viz. *A. aculeatum*, G. F. W. Mey., *A. Ayri*, Mart. (*Toxophænix aculeatissima*, Schott), *A. campestre*, Mart., *A.*

Murumuru, Mart., *A. rostratum*, Hook., *A. Tucuma*, Mart., and *A. vulgare*, Mart.

From the number of spines with which these Palms are clad, they have rather a repulsive aspect, yet nevertheless, and notwithstanding their being "armed to the teeth," it has not prevented man from approaching them, and finding out their various useful properties. *Astrocaryum vulgare*, Mart. (*A. Awarra*, Hort.),—every part of which, even the edges of the segments of the leaves, bristles with sharp spines,—is of great importance to the Indians of Brazil, who term it Tucum, and cultivate it in their mandioc-fields and about their huts,—not for the sake of its fruit, for that is scarcely eatable, but for the sake of its unexpanded leaves, from which they manufacture cordage, superior in fineness, strength, and durability to that procured from the Miriti (*Mauritia flexuosa*, Linn.), and serving for bow-strings, fishing-nets, hats, fans, and other purposes where fineness, combined with strength, is required. The Brazilians of the Rio Negro and the Upper Amazon make beautiful hammocks of Tucum-thread, knitted by hand into a compact web of so fine a texture as to occupy two persons three or four months in the completion of one hammock. These sell at about £3 each, and when ornamented with

feather-work borders, at double that sum. Most of them are sent as presents to Rio Janeiro.

The Tucum has occasionally been confounded with the Tucuma (*Astrocaryum Tucuma*, Mart.), to which indeed it is nearly allied, and in company with which it is often seen in the dry forest land (*terra firme*) of the Upper Amazon and Rio Negro. The Tucuma is never used for making cordage, but the fleshy part of its fruit is esteemed for food by the Indians, and the stony seeds are turned into rings, "birros" (or knitting pins), and other smaller articles for which bones are employed. Two other species of this genus also produce edible fruit: I mean the Lú (*A. acaule*, Mart.), an almost stemless Palm inhabiting the Catinga forests of the Upper Rio Negro, and from the outer portion of the leaf-stalks of which the Indians make baskets; and the Murumurú (*A. Murumuru*, Mart.), growing in humid places of the Brazilian forest. The fruit of the latter has—I quote Kunth's description—an agreeable flavour, and, at first, a scent resembling musk, but afterwards that of a melon. Wallace, too, states that the fleshy covering of the fruit is rather juicy, and eatable, but he does not mention the agreeable fragrance to which the former author alludes; nor does he dwell much upon the partiality of man to this

fruit, but gives instead some account of the high favour in which beasts hold it. "On the Upper Amazon," he says, "cattle eat the fruit of the Murumurú, wandering about for days in the forests to procure it. The hard stony seeds pass through their bodies undigested, and become thickly scattered over the pastures of that district; they are so hard that it is almost impossible to break them, except by a powerful blow with a large hammer; the kernel (*albumen*) is also very hard, nearly approaching to vegetable ivory. Yet pigs are very fond of these seeds, and on one estate on the Upper Amazon, where I was staying, they had scarcely anything to eat, during a part of the year, save those which had already passed through the stomachs of the cows. They might constantly be seen cracking the shell (*putamen*) with their powerful jaws, and grinding up the hard kernel, on which the teeth of few other animals could make any impression. They not only existed on this food, but in some cases actually got fat upon it.

Genus V. *ATTALEA*, *Humboldt, Bonpland, and Kunth.*

Of late years the streets of London have been, in places at least, kept peculiarly neat and clean, by brooms and brushes made of a new material,—those of the machines as well as those employed by hand. If the question is asked, what is this new material, the reply often heard is, “Whalebone, I suppose.” But, no; it is not of animal, but of vegetable origin. Piassaba,* the coarse black fibre of a species of *Attalea* (*A. funifera*, Mart.), a genus composed of about twenty members, ten of which (*A. amygdalina*, H. et K., *A. Butiros*, Lodd., *A. Cohune*, Mart., *A. compta*, Mart., *A. coronata*, Lodd., *A. excelsa*, Mart., *A. funifera*, Mart., *A. Maripa*, Mart., *A. speciosa*, Mart., and *A. spectabilis*, Mart.) are cultivated in our gardens; they are all natives of the American Continent, where they range from the mouth of the La

* Wallace has declared the Piassaba to be a species of *Leopoldinia*. Sir W. J. Hooker (Hook. Journal of Bot. and Kew Misc., vol. 1. p. 121), in common with other botanical writers of high repute, consider it as the *Attalea funifera* of Martius. I have looked upon Wallace’s *L. Piassaba* as identical with *Attalea funifera*, as I cannot discover in anything Wallace has written upon the subject, either a positive or a negative proof to lead me to a contrary conclusion. Wallace himself informs us that he neither saw the flower nor the fruit of his new *Leopoldinia*. “How,” botanists ask, “could he know then that it is a *Leopoldinia*, and not an *Attalea*?”

those of the New Zealand one; but there is great variation in these respects with both species. Dr. von Martius also separates them, but gives Forster's name to the Norfolk Island plant, whereas Forster figured the New Zealand one only, to which the name *sapida* must remain attached, whilst that of *Baueri* may be given to the Norfolk Island species, if it should prove really distinct. There is as much difference between the narrow and broad segments of specimens of *A. sapida*, growing in Kew Gardens, as between the latter and those of *A. Baueri*."

Attalea funifera of Martius (*Leopoldinia Piassaba*, Wallace, *Cocos lapidea*, Gärtn., *Lithocarpus cocciformis*, Targ.-Tozz.), termed by the Brazilians Piassaba, and by the Venezuelians Chiquichiqui, has a very extensive distribution on the eastern side of South America, where it grows in swampy or partially flooded lands on the banks of rivers.*

* Wallace, speaking of the distribution of this Palm, in those parts with which he is more intimately acquainted, says:—"It grows in swampy or partially flooded lands, on the banks of black-water rivers. It is first found on the river Padanari, a tributary of the Rio Negro, on its northern side, about four hundred miles above Barra, but the waters of which are not so black as those of the Rio Negro. The Piassaba is found from near the mouth to more than one hundred miles up, where it ceases. On the banks of the Rio Negro itself not a tree is to be seen. The next river, the Darahá, also contains some. The next two, the Marahivá and Cababuris, are white-water rivers, and have no Piassaba. On the south bank, though all the rivers have black

The trunk reaches twenty to thirty feet in height. The leaves are very large, and their leaflets rigid, but slightly drooping at the tips: they form an excellent thatch. The dilated base of the petioles separates, like that of *Arenga saccharifera*, into a long, coarse fringe, which is collected by the natives, and partly used for home consumption, partly exported to Europe, tied up in bundles of several feet in length, and sold in London at the price of about £14 the ton, under the name of Piassaba (*Piaçaba*).

This fibre is an extensive article of commerce in the country where it grows, and it seems to have been used from a very early period to form cables for the canoes na-

water, there is no Piassaba till we reach the Marié, not far below St. Gabriel. Here it is extensively cut for about one hundred miles up, but there is still none immediately at the mouth, or on the banks of the Rio Negro. The next rivers, the Curicuriari, the great river Uaupés, and the Isáúna, though all black waters, have none; while further on, in the Xié, it again appears. On entering Venezuela, it is found on the banks of the Rio Negro, and is abundant all up to its sources, and in the Témí and Atabapo, black-water tributaries of the Orinoco. This seems to be its northern limit, and I cannot hear of its again appearing in any part of the Amazon or Orinoco, or its tributaries. It is thus entirely restricted to a district about three hundred miles from north to south, and an equal distance from east to west. I am enabled so exactly to mark out its range from having resided more than two years among people whose principal occupation consisted in obtaining the fibres of this tree."—Wallace's '*Palm Trees*,' p. 19.

vigating the Amazon : it is well adapted for this purpose, as it is light—the cables made of it not sinking in water—and very durable. It twists firmly into cordage, from the fibres being rough-edged ; and as it is very abundant, and is procured and manufactured by the Indians, ropes made of it are much cheaper than any other kind of cordage. The price in the city of Barra, in June, 1852, was 400 reis (one shilling English) for 32 lbs. of the fibre, and 800 reis (two shillings) for every inch in circumference of a cable sixty fathoms long,—the standard length they are all made to. Before the independence of Brazil, the Portuguese Government had a factory at the mouth of the Paduarí, one of the tributaries of the Rio Negro, for the purpose of making these cables, for the use of the Pará arsenal, and as a Government monopoly. Until the last few years, the fibre was all manufactured into cordage on the spot, but it is now taken down, in long conical bundles, for exportation from Pará to England. It is cut by men, women, and children, from the upper part of the younger trees, so as to secure the freshest fibres ; the taller trees, which have only the old and half-rotten portion within reach, being left untouched. The trees are much infested by venomous snakes, a species of *Craspedocephalus*, and

the Indians, when at work, are not unfrequently bitten by them, sometimes with fatal consequences.

The nuts of the Piassaba are also an article of commerce, long brought to England under the name of "Coquillas." Being excessively hard, beautifully mottled with dark and light brown, and capable of taking a very high polish, they are extensively used for turnery-work, especially in making the handles of bell-pulls, the knobs of walking-sticks and umbrellas, and similar articles.

Another *Attalea*, the commercial importance of which has only lately become apparent, is *Attalea Cohune* of Martius, the northernmost species of the genus. In speaking of this Palm, Mr. R. Temple, Chief Justice of British Honduras, in a letter addressed to Mr. Le Nève Forster, dated Belize, April 15, 1854, and published in the 'Journal of the Society of Arts' (vol. ii. no. 81, p. 500), says:—"My chief object in addressing you is to draw your attention, and through you that of the public, to a valuable article of commerce, hitherto much neglected, and growing Honduras spontaneously, and in profuse abundance; I allude to the nut of the Cohune Palms.* The Cohune resembles in appearance the Cocoa-nut Palm, but it is not

* Written also Cahonn.

THE
REIGN OF. QUEEN ANNE
II.